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BOARD-FOOT TREE VOLUME TABLES AND EQUATIONS FOR WHITE SPRUCE IN INTERIOR ALASKA

by

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INTRODUCTION

The board-foot volume tables and equations, presented here for white spruce (*Picea glauca* (Moench) Voss), supplement cubic-foot volume tables published earlier.[1] They were made primarily for use in white spruce growth and yield studies,[2] but are suitable for other uses such as timber sales, management plans, and forest inventory. These tables differ from those prepared by Haack (1963)[3] in that volumes are estimated to a fixed top diameter of 6 inches inside bark rather than to a merchantable top. Also, the basic data consist of measurements of nearly twice as many trees.

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[1] Gregory, Robert A., and Haack, Paul M. Equations and tables for estimating cubic-foot volume of interior Alaska tree species. U.S. Forest Serv. Res. Note NOR-6, 21 pp. 1964.

[2] Farr, Wilbur A. Growth and yield of well-stocked white spruce stands in Alaska. (In preparation for publication. Pacific Northwest Forest & Range Exp. Sta., Inst. North. Forest , U.S. Forest Serv., Juneau, Alaska.)

[3] Haack, Paul M., Jr. Volume tables for trees of interior Alaska. U.S. Forest Serv. Res. Note NOR-5, 11 pp. 1963.

METHODS

The basic data used in constructing these tables and equations were obtained from 309 trees larger than 8.5 inches in diameter at breast height (D), and ranging in height (H) from 40 to 120 feet. Nearly all were from well- or moderately well-stocked stands; few open-grown trees were included in the basic data. The majority were from north of the Alaska Range.

The International 1/4-inch and Scribner rules for 16-foot logs[4] were used to compute board-foot volumes of the sample trees. Volumes were computed from a 1-foot stump to a 6-inch top inside bark.

Predictor equations for V_4 (volume, International 1/4-inch rule) and V_5 (volume, Scribner rule) were determined by stepwise regression analysis.[5] Variables were tested by unweighted and weighted regression, as described by Gregory and Haack.[6] Weighting proved helpful in both board-foot equations. Efficiency of weighted vs. unweighted regression was 1.06 for International 1/4-inch rule volume and 1.13 for Scribner rule volume. Merging did not take place within the range of tabular values.

The weighted equations used and their precision are given in footnote 1 of each volume table.

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[4] Plus 0.3-foot trim allowance.

[5] Dixon, W. J., ed. Biomedical computer programs. Sch. Med., Dep. Prev. Med. Public Health, 620 pp., illus. Los Angeles: University of California. 1965.

[6] See footnote 1.

Table 1.--Board-foot tree volumes (1-foot stump to 6-inch top), International 1/4-inch rule, for white spruce, interior Alaska[1]

D.b.h.[2] (inches)	Total height (in feet)[3]																				Basis: trees meas-ured[4]
	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	
9	42	43	44	45	46	47	48	49	51	52	53	54	55	56	57	58					26
10	48	51	53	56	59	62	64	67	70	73	75	78	81	84	86	89					35
11	53	57	62	67	71	76	81	85	90	94	99	104	108	113	117	122					35
12		64	71	77	84	90	97	104	110	117	124	130	137	144	150	157	163	170			39
13		70	79	88	97	105	114	123	132	141	150	158	167	176	185	194	203	211			48
14		76	87	98	109	121	132	143	154	165	177	188	199	210	222	233	244	255	266	276	31
15		81	95	109	122	136	150	164	178	191	205	219	233	246	260	274	288	301	315	328	25
16			103	119	136	152	169	185	202	218	235	251	268	284	301	317	334	350	367	382	17
17			111	130	149	169	188	208	227	246	266	285	305	324	343	363	382	402	421	439	18
18				141	163	186	208	231	253	276	298	321	343	366	388	411	433	456	478	499	12
19					177	203	229	254	280	306	332	357	383	409	435	460	486	512	538	562	7
20					191	221	250	279	308	337	367	396	425	454	483	513	542	571	600	628	6
21							272	304	337	370	403	436	469	501	534	567	600	633	665	697	3
22							294	331	367	404	441	477	514	550	587	624	660	697	733	768	2
23									398	439	479	520	561	601	642	682	723	763	804	843	--
24									430	475	520	564	609	654	699	743	788	833	877	921	2
25											561	610	659	708	757	807	856	905	954	1,001	1
26											604	658	711	765	818	872	925	979	1,033	1,085	1
27											649	707	765	823	881	940	998	1,056	1,114	1,171	--
28											694	757	820	883	946	1,010	1,073	1,136	1,199	1,260	--
29											741	809	877	946	1,014	1,082	1,150	1,218	1,286	1,353	--
30											790	863	936	1,009	1,083	1,156	1,229	1,303	1,376	1,448	--
31											839	918	997	1,075	1,154	1,233	1,311	1,390	1,469	1,546	--
32											891	975	1,059	1,143	1,227	1,312	1,396	1,480	1,564	1,647	1

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[1] Table volumes obtained from weighted regression equation: $V_4 = 26.211 + 8.4254D - 0.73439D^2 - 1.2126H + 0.017629D^2H - \frac{575.27}{D^2}$, where V_4 = volume, International 1/4-inch rule; D = diameter at breast height; H = height. Standard error or estimate = 20.3 bd. ft. or 11.68 percent of the mean volume.

[2] Midpoint ot class (e.g., 12 = 11.6 through 12.5 inches).

[3] Midpoint of class (e.g., 70 = 67.6 through 72.5 feet).

[4] Lines contain basic data for 309 measured trees used for computing regression equation.

Table 2.--Board-foot tree volumes (1-foot stump to 6-inch top), Scribner rule, for white spruce, interior Alaska[1]

D.b.h.[2] (inches)	Total height (in feet)[3]																				Basis: trees meas-ured[4]
	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	
9	31	32	32	33	34	34	35	35	36	37	37	38	38	39	40	40					26
10	35	37	39	41	43	46	48	50	52	54	56	58	61	63	65	67					35
11	38	42	46	50	54	58	61	65	69	73	77	81	84	88	92	96					35
12		47	53	59	64	70	76	81	87	93	98	104	110	115	121	127	132	138			39
13		52	60	67	75	83	91	98	106	114	121	129	137	144	152	160	167	175			48
14		57	67	77	86	96	106	116	126	136	146	156	165	175	185	195	205	215	225	234	31
15		62	74	86	98	110	123	135	147	159	171	184	196	208	220	232	245	257	269	280	25
16			81	96	110	125	140	154	169	184	199	213	228	243	257	272	287	301	316	330	17
17			88	106	123	140	158	175	192	210	227	244	262	279	297	314	331	349	366	382	18
18				116	136	156	176	197	217	237	257	277	297	318	338	358	378	398	419	438	12
19					150	173	196	219	242	265	288	312	335	358	381	404	427	451	474	496	7
20					164	190	216	242	269	295	321	348	374	400	427	453	479	506	532	557	6
21							237	267	296	326	356	385	415	445	474	504	533	563	593	621	3
22							259	292	325	358	391	425	458	491	524	557	590	623	656	688	2
23									355	392	429	465	502	539	575	612	649	686	722	758	--
24									386	427	467	508	548	589	629	670	710	751	791	831	2
25											507	552	596	641	685	730	774	818	863	906	1
26											549	598	646	695	743	792	840	889	937	985	1
27											592	645	698	750	803	856	909	962	1,015	1,066	--
28											637	694	751	808	865	923	980	1,037	1,094	1,158	--
29											682	744	806	868	930	992	1,053	1,115	1,177	1,238	--
30											730	796	863	930	996	1,063	1,129	1,196	1,263	1,328	--
31											778	850	922	993	1,065	1,136	1,208	1,279	1,351	1,422	--
32											829	906	982	1,059	1,135	1,212	1,288	1,365	1,442	1,518	1

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[1] Table volumes obtained from weighted regression equation: $V_5 = 39.710 + 4.2659D - 0.55865D^2 - 1.1184H + 0.016113D^2H - \frac{437.92}{D^2}$, where V_5 = volume, Scribner rule; D = diameter at breast height; H = height. Standard error of estimate = 17.3 bd. ft. or 11.76 percent of the mean volume.

[2] Midpoint of class (e.g., 12 = 11.6 through 12.5 inches).

[3] Midpoint of class (e.g., 70 = 67.6 through 72.5 feet).

[4] Lines contain basic data for 309 trees used for computing regression equation.

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